may be climbed with greater or less safety by the aid of several small holes in its face. These holes were doubtless made artificially, but as the narrow pathway at this point is now a drainage course during periods of storm, the soft sandstone has become so much eroded that they have apparently lost their former shape.

The summit of Encantada was reached after some difficulty. It has been swept and carved and swept again by the winds and rains of centuries since the ancestors of the simple Acomas climbed the ladder-trail of which we found the traces. The pinnacled floor has not always appeared as it is to-day, for it was once thickly mantled by the sherd-strewn soil that now forms a goodly part of the great talus heaps below.

There is little wonder, then, that the party despaired of finding even a single relic when they had reached the top of the trail and looked about at the destruction wrought; and yet they had been on the summit only a few minutes when a sherd of pottery of very ancient type, much crackled by weathering, was found. This fragment is of plain grey ware, quite coarse in texture, with a dégraissant of white sand.

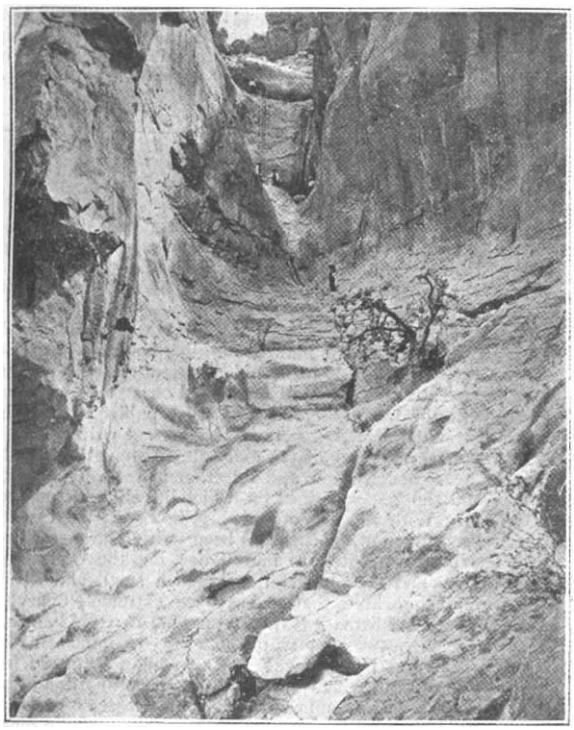

FIG. 2.—The Great Sandstone Cleft of the Mesa. Through this cleft the traditional trail passed, and distinct traces of it were found on each side of the vertical fissure to the right of the upper ladder.

During the twenty hours spent on the summit, every opportunity was taken of making a critical study of the general features of the top of Katzímo throughout the 2500 feet of its length, special consideration being devoted to the topography of the site, the erosion, the earthy deposits, the drainage, and the great cedars that stand gaunt and bare or lie prone and decaying because their means of subsistence have been so long washed away, and the party was forced to the conclusion that had house-walls, whether of stone or adobe, ever existed on the summit at a reasonably remote period, there was no possibility that any trace of them could have remained to this day. Nevertheless, the abundance of ancient relics in the talus, the distinct remains of the ladder-trail, the specimens found on the summit coupled with the destruction wrought by nature, the tradition itself—all testify to the former habitation of the site.

To the Acomas Katzímo is still enchanted, and as a subject in the study of mysticism the man of science must yet regard it. The law of a millennium is not undone by a few hours of iconoclasm.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—On March 15, Convocation will consider some alterations in the statute relating to the Aldrichian Demonstratorship in Comparative Anatomy, rendered vacant by the resignation of Dr. Blaxland Benham, who has been appointed Professor of Biology at Otago, New Zealand. Mr. Gilbert Bourne, of New College, has, in the meantime, been nominated as Lecturer in Comparative Anatomy, and his name will be submitted to Convocation on the same day.

Dr. Benham will be entertained at a farewell dinner by his colleagues on Friday.

The Junior Scientific Club met on Wednesday evening, March 9. Mr. A. W. S. Fisher read a paper on the salmon, and Mr. T. Annandale discussed the habits of British Amphibia. The officers for next term were elected. The Club proposes to hold its biennial conversazione next term, and arrangements are being pushed forward rapidly.

The cast of the skeleton of Iguanodon, which has been purchased by subscription, has now been set up in the court of the University Museum. Some valuable casts of other fossil reptiles have also been recently added to the collections.

CAMBRIDGE.—The honorary degree of Doctor of Science is to be conferred on Dr. Wilhelm Pfeffer, Professor of Botany in the University of Leipzig, and Croonian Lecturer at the Royal Society.

The Agricultural Examinations Syndicate report that ten candidates presented themselves for Part I., and nine for Part II. of the Examination for the diploma of the University. Six candidates were successful in both parts. The numbers show some increase on those of past years.

Regulations for the Gedge Prize in Physiology, taken in a broad sense, have been published. The prize will be given biennially for an original memoir or essay, and will consist of two years' interest on the capital sum of 1000*l*. Candidates must have worked in the University laboratories during six terms, and be of at least five, and at most seven, years' standing from matriculation.

The application for the recognition of St. Edmund's Hostel as a place of residence for students preparing for the secular priesthood of the Church of Rome, led to an animated discussion in the Senate on March 3. The weight of opinion was in favour of granting the application.

THE Senatus Academicus of the University of Edinburgh have resolved to offer the honorary degree of Doctor of Laws to Mr. Horace T. Brown, F.R.S.

PRESIDENT CHARLES DE GARMO, of Swarthmore College, Pa., has been elected to the professorship of the science and art of education at Cornell University, rendered vacant by the resignation of Prof. S. G. Williams; and Prof. Herbert Hibbard, of the University of Minnesota, has been elected assistant professor of mechanical engineering of railways and principa of the graduate school of railway, mechanical engineering.

NEARLY 55 per cent. of the net total of the Estimates for Civil Services, agreed to by the House of Commons on March 3, arises under the class of education, science and art, which shows a net increase of 457,094*l*. over the grants of last Session. To the total of the class—viz. 11,965,796*l*.—the three Public Education Estimates contribute 11,028,776*l*., being a net increase of 425,903*l*. The chief remaining increase is 22,663*l*. under the Science and Art Department Estimate (mainly for additional payments to science schools for attendance and on results). An important change has been effected in transferring to the Education Departments, England and Scotland, the grants, &c., for drawing in elementary schools, hitherto borne on the Science and Art Department's Vote, and in transferring to the Scotch Education Department the other Science and Art grants in Scotland.

A NOTEWORTHY feature of the little volume of announcements of classes held in the Northampton Institute, Clerkenwell, is a table of special courses adapted to various classes of students. By referring to this table, any young artisan can see what courses he ought to take to educate himself in the scientific principles of his trade. Similar guides to study, now often inserted in the prospectuses of technical institutes, are of great value in inducing students to take up systematic courses of instruction,

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and the Northampton Institute has done well to adopt such a means of encouraging earnest work. The Lord Mayor and Sheriffs have consented to pay a State visit to the Institute on March 18, for the purpose of inspecting it and declaring it formally open. The buildings and equipment have up to the present cost over 80,000*l.*, and the expenditure upon the latter is not yet complete. In addition the land—over one and a quarter acres—generously given by the late Marquis of Northampton, is estimated to be worth not less than 25,000*l.* The Institute is a branch of the City Polytechnic, and is situated in one of the busiest parts of the metropolis immediately north of the City boundary.

FROM the sixth annual report of the Technical Instruction Committee of the City of Liverpool, we gather the following items:—The Committee clearly recognises that technical education is inseparably bound up with general secondary and higher education, and must be organised in vital connection therewith.—After some delay, a commencement has been made with the erection of the new Central Technical Schools. The cost of the erection of the building comprising the new schools and the museum extension will be nearly 90,000*l.*—The Committee remark that it would be more satisfactory if greater attention were paid to mensuration and other practical applications of elementary mathematics; since it is a frequent complaint, on the part of teachers of special technical classes, that their students come to them with too little mathematical knowledge and aptitude, and are often unable to grapple with even simple quantitative problems. This difficulty not only applies to Liverpool, but to technical classes in most parts of the country.—The co-operation of the University College with the educational work of the Committee is most satisfactory, and is of great assistance in the construction of an organised scheme of technical instruction.

THE London University Commission Bill was read a second time in the House of Lords on Friday last. In moving the second reading, the Duke of Devonshire pointed out that the measure was founded on the recommendations of the Royal Commission which reported in favour of the two functions of teaching and examining being combined in one University for London. The Bill is substantially the same as that which passed the House of Lords in the last Session of Parliament, but reached the House of Commons too late to be carried through all its stages. To provide against the occurrence of a similar difficulty, the Bill has been introduced earlier in the year than has hitherto been found possible; which gives grounds for the hope that it will take its place on the Statute-book before the close of the present Session. A very large part of the formidable opposition against the Bill has been removed by the introduction of certain modifications. These amendments are in the direction of restricting the power of any future Senate to alter the statutes or regulations made by the Statutory Commission in accordance with the provisions contained in the schedule of the present measure. "I cannot even now assert that opposition no longer exists," said the Duke of Devonshire, "but it is very difficult indeed to understand upon what grounds the measure can be opposed. I have endeavoured to show by what an overwhelming amount of scientific teaching, opinion, and experience it is supported, and I am utterly unable to discover any weight of opinion on the other side which can for a moment enter into competition with the expressions in its favour." Lord Herschell and Lord Reay warmly supported the Bill, which was then read a second time

AT the recent meeting of the Federated Institution of Mining Engineers, Prof. Henry Louis, Durham College of Science, Newcastle, read a paper on "Technical Education in Mining," which should be seen by all Technical Education Committees having mining classes. Prof. Louis made, at the outset, a broad distinction between the training suitable to the working miner or subordinate mine official, and that suitable to mining engineer or general manager. As regards the former he ought to leave his Board school in about the fifth standard, and commence receiving his technical instruction—a very different thing from technical education—underground, whilst continuing his scientific education in evening continuation and science schools. It is greatly to the discredit of the powerful and wealthy miners' unions of this country, that they make no attempt to provide the rising generation with scientific training bearing on their work, especially seeing that such training is the best possible safeguard against accident. For both working miners and engineers, the present legislation, that takes no account of time spent in learning the sciences underlying the art of mining, is most pernicious. Mining students ought to enter some mining college at the age of seventeen, and devote at least three years to learning first the pure and then the applied sciences that they will require in their profession, but none of the pure sciences need to be studied very profoundly. The systematic neglect of the study of dressing of minerals in this country has already had serious commercial results, *e.g.* at Nenthead, and its cultivation is urged. Prof. Louis suggests the introduction of the American system of "Summer Mining Schools" as a method worthy of trial for giving college students an insight into practical work, but points out that college work alone without practical experience is insufficient. On the very open question as to whether college work should precede or follow practical training, Prof. Louis holds the former to be probably the better plan. He concludes with the following recommendations. (1) Every manager of a mine, whether coal or metalliferous, to hold a certificate. (2) Examinations for certificates to be controlled by a central Board, and made uniform in conditions and character for the whole of Great Britain (and if possible for the Colonies also) (3) Residence in a recognised science college to count as part of term of apprenticeship, whilst not less than three years underground should also be insisted on. (4) Every mine surveyor to hold a certificate of proficiency.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 27.—"Mathematical Contributions to the Theory of Evolution. On the Law of Ancestral Heredity." By Karl Pearson, F.R.S., University College, London.

The Darwinian theory has for its main factor the perpetuation of favourable variations by natural selection under the law of heredity. Hence any complete quantitative treatment of evolution must deal (1) with the nature and distribution of variation; (2) with the nature and influence of selection, and this not only upon the selected but upon all correlated characters or organs; and (3) with the law of heredity. Earlier published and other written but unpublished papers of the present writer cover to some extent the ground of (1) and (2). Although the mathematical theory of variation and selection is yet very far from completion, the general lines on which it will proceed seem fairly clear. With the law of heredity, however, the case has hitherto been different. Much has been written on the subject, much has been attributed to inheritance, but the quantitative measurements and facts have formed such a small and slender proportion of the whole, that it has been extremely difficult to base a rounded mathematical theory on what is really known.

The very suggestive theory of heredity developed in Mr. Galton's "Natural Inheritance" has two main features: (*a*) a theory of regression, which states the average proportion of any character which will be inherited under any degree of relationship. This theory is very simple: if the average of the sons of any parent has w of the parent's deviation from the average parent, then the average grandson would have w^2 of the deviation, and so on. Collateral heredity is also determined, and for two brothers was found equal to $2w$. Mr. Galton's value of w was $\frac{1}{3}$.

(*b*) A law of ancestral heredity. According to this law the two parents contribute $\frac{1}{4}$, the four grandparents $\frac{1}{8}$, the eight great grandparents $\frac{1}{16}$, and so on, of the total heritage of the average offspring.

These two parts of the theory, however, are not in entire agreement.

The recent publication of Mr. Galton's remarkable paper on ancestral heredity in Bassett hounds has, however, led the writer to reconsider (*b*). If that law be true, then for every organ and for every grade of kinship the amount of heredity is numerically determinable. The solution of the problem of heredity is thrown back upon the solution of an infinite series of linear equations. Their solution gives results which seem to the writer in good agreement with all we at present know about the influence of heredity in various degrees of kinship. For example, fraternal is no longer *twice* filial regression, but has a value (0·4000) well in accordance with calculations of English stature and Indian cephalic index. In short, if we discard Mr. Galton's relations between the regressions for various grades of kinship, and start

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